

A USER'S GUIDE FOR THE STRAIN INDEX

This guide describes how to perform the five steps associated with using the Strain Index. Page 1 describes the rating criteria and the measurements and calculations for the six task variables. The numerical ranges for assigning rating criteria for the subjective variables are only guidelines. Page 2 includes a table for entering your data and guides you through calculating an SI score.

STEP 1: DATA COLLECTION:

1. **INTENSITY OF EXERTION** is an estimate of the strength required to perform the task one time. Guidelines for assigning a rating criterion are presented in the following table. Write the most appropriate rating criterion into the data table.

Rating Criterion	%MS ^A	Borg Scale ^B	Perceived Effort
Light	< 10%	≤ 2	Barely noticeable or relaxed effort
Somewhat Hard	10% - 29%	3	Noticeable or definite effort
Hard	30% - 49%	4 - 5	Obvious effort; Unchanged facial expression
Very Hard	50% - 79%	6 - 7	Substantial effort; Changes facial expression
Near Maximal	≥ 80%	> 7	Uses shoulder or trunk to generate force

^A Percentage of maximal strength.

^B Compared to the Borg CR-10 scale.⁽⁷⁶⁾

2. **DURATION OF EXERTION** is calculated by measuring the duration of all exertions during an observation period, then dividing the measured duration of exertion by the total observation time and multiplying by 100.

$$\% \text{ DURATION OF EXERTION} = 100 \times \frac{\text{duration of all exertions (sec)}}{\text{total observation time (sec)}} = 100 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

3. **EFFORTS PER MINUTE** are measured by counting the number of exertions that occur during an observation period, then dividing the number of exertions by the duration of the observation period, measured in minutes.

$$\text{EFFORTS PER MINUTE} = \frac{\text{number of exertions}}{\text{total observation time (min)}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

4. **HAND/WRIST POSTURE** is an estimate of the position of the hand or wrist relative to neutral position. Guidelines for assigning a rating criterion are presented in the following table. Enter the result in the data table.

Rating Criterion	Wrist Extension ^A	Wrist Flexion ^A	Ulnar Deviation ^A	Perceived Posture
Very Good	0° - 10°	0° - 5°	0° - 10°	Perfectly neutral
Good	11° - 25°	6° - 15°	11° - 15°	Near neutral
Fair	26° - 40°	16° - 30°	16° - 20°	Non-neutral
Bad	41° - 55°	31° - 50°	21° - 25°	Marked deviation
Very Bad	> 60°	> 50°	> 25°	Near extreme

^A Derived from data presented in Stetson et al.⁽²⁰⁾

5. **SPEED OF WORK** is an estimate how fast the worker is working. Guidelines for assigning a rating criterion are presented in the following table. Enter the result in the data table.

Rating Criterion	Compared to MTM-1 ^A	Perceived Speed
Very Slow	≤ 80%	Extremely relaxed pace
Slow	81 - 90%	"Taking one's own time"
Fair	91 - 100%	"Normal" speed of motion
Fast	101 - 115%	Rushed, but able to keep up
Very Fast	> 115%	Rushed and barely or unable to keep up

^A The observed pace is divided by MTM-1's predicted pace and expressed as a percentage of predicted. See Barnes.⁽⁸²⁾

6. **DURATION OF TASK PER DAY** is either measured or obtained from plant personnel. Enter the result in the data table.

STEP 2: ASSIGN RATINGS VALUES

Use the table below to find the rating values for each task variable. Select the appropriate entry for each variable, then find the corresponding rating value is on the same row at the far left.

Rating Values	Intensity of Exertion	Duration of Exertion	Efforts/Minute	Hand/Wrist Posture	Speed of Work	Duration per Day
1	Light	< 10	< 4	Very Good	Very Slow	≤ 1
2	Somewhat Hard	10 - 29	4 - 8	Good	Slow	1 - 2
3	Hard	30 - 49	9 - 14	Fair	Fair	2 - 4
4	Very Hard	50 - 79	15 - 19	Bad	Fast	4 - 8
5	Near Maximal	≥ 80	≥ 20	Very Bad	Very Fast	≥ 8

STEP 3: DETERMINE THE MULTIPLIERS

Rating Value	Intensity of Exertion	Duration of Exertion	Efforts/Minute	Hand/Wrist Posture	Speed of Work	Duration per Day
1	1	0.5	0.5	1.0	1.0	0.25
2	3	1.0	1.0	1.0	1.0	0.5
3	6	1.5	1.5	1.5	1.0	0.75
4	9	2.0	2.0	2.0	1.5	1.0
5	13	3.0 ^A	3.0 ^A	3.0	2.0	1.5

^A If duration of exertion is 100%, then efforts/minute multiplier should be set to 3.0.

ENTER YOUR DATA HERE:

	Intensity of Exertion	Duration of Exertion	Efforts/Minute	Hand/Wrist Posture	Speed of Work	Duration per Day
Step 1: Rating Criterion or Measured Result						
Step 2: Rating Value						
Step 3: Multiplier						

STEP 4: CALCULATE THE SI SCORE

Insert the multiplier values for each of the 6 task variables into the spaces below, then multiply them all together.

Intensity of Exertion	X	Duration of Exertion	X	Efforts per Minute	X	Hand/Wrist Posture	X	Speed of Work	X	Duration of Task	=	SI SCORE

STEP 5: INTERPRET THE RESULT

Preliminary testing has revealed that jobs associated with distal upper extremity disorders had SI Scores greater than 5. SI Scores less than or equal to 3 are probably “safe.” SI Scores greater than or equal to 7 are probably “hazardous.” The Strain Index does not consider stresses related to localized mechanical compression. This risk factor should be considered separately.